

CLAIMS

WHAT IS CLAIMED:

1. A method, comprising:

operating an implantation tool with a first species including a first dopant;

operating said implantation tool with xenon as an implant precursor to reduce residues
of said first species in said implantation tool; and

operating said implantation tool with a second species including a second dopant.

2. The method of claim 1, wherein said first dopant comprises at least one of
arsenic, indium and antimony.

3. The method of claim 2, wherein said second dopant comprises one of boron
and phosphorus.

4. The method of claim 1, wherein said xenon is accelerated with an energy in
the range of approximately 30-200 keV.

5. The method of claim 1, wherein said xenon is accelerated with an energy in
the range of approximately 40-160 keV.

6. The method of claim 1, wherein a dose is in the range of approximately
 1×10^{13} to 1×10^{14} ions/cm² when operating said implantation tool with xenon.

7. The method of claim 1, wherein said implantation tool is operated with xenon for a time interval in the range of approximately 2-10 minutes.

8. The method of claim 1, further comprising purging and evacuating said implantation tool at least once prior to operating said implantation tool with said second species.

9. The method of claim 1, wherein operating said implantation tool with said first species includes implanting said first dopant into a semiconductor region of a substrate to form one of a well profile and a halo profile for a transistor structure.

10. The method of claim 9, wherein operating said implantation tool with said xenon includes implanting xenon ions into said semiconductor region to amorphize a portion thereof.

11. The method of claim 1, wherein operating said implantation tool with said xenon is performed without a substrate placed in said implantation tool.

12. The method of claim 1, wherein operating said implantation tool with said xenon is performed with a substrate that has not been exposed to said first species.

13. A method of doping a substrate, the method comprising:
operating an implantation tool with xenon as the implantation species prior to installing said substrate in the implantation tool to reduce contaminating particles;
and

operating said implantation tool with the substrate mounted therein to implant a first species of dopants in the substrate.

14. The method of claim 13, further comprising operating said implantation tool with a second species other than said first species prior to operating said implantation tool with xenon.

15. The method of claim 13, wherein said first species is one of arsenic, indium, antimony, boron and phosphorus.

16. The method of claim 14, wherein said second species is one of arsenic, indium, antimony, boron and phosphorus.

17. The method of claim 14, wherein said first species is one of boron and phosphorus.

18. The method of claim 14, wherein said second species is one of arsenic, indium and antimony.

19. The method of claim 13, wherein said xenon is accelerated with an energy in the range of approximately 30-200 keV.

20. The method of claim 13, wherein said xenon is accelerated with an energy in the range of approximately 40-160 keV.

21. The method of claim 13, wherein a dose is in the range of approximately
1 \times 10¹³ to 1 \times 10¹⁴ ions/cm² when operating said implantation tool with xenon.

22. The method of claim 13, wherein said implantation tool is operated with
xenon for a time interval in the range of approximately 2-10 minutes.

23. A method of doping substrates, the method comprising:
mounting a substrate in an implantation tool;
operating said implantation tool with a first species of dopants to implant said first
dopant into a crystalline region of said substrate;
operating said implantation tool with xenon as the implantation species to substan-
tially amorphize a portion of said crystalline region; and
operating said implantation tool with a second species of dopants to implant said
second dopant into said substantially amorphized portion.

24. The method of claim 23, wherein said xenon is implanted with an energy in
the range of approximately 30-200 keV.

25. The method of claim 23, wherein said xenon is implanted with an energy in
the range of approximately 40-160 keV.

26. The method of claim 23, wherein a dose is in the range of approximately
1 \times 10¹³ to 1 \times 10¹⁴ ions/cm² when operating said implantation tool with xenon.

27. The method of claim 23, further comprising, prior to amorphizing said portion, operating said implantation tool with xenon when said substrate is removed from said implantation tool to reduce residues of said first species.